

36
POWER COST STUDY

MISSOURI 59 COIE

UNITED STATES DEPARTMENT OF AGRICULTURE
U. S. RURAL ELECTRIFICATION ADMINISTRATION,
WASHINGTON 25, D.C.

Power Division//

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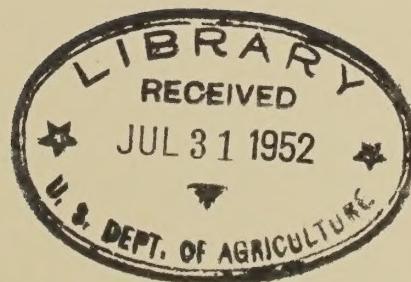
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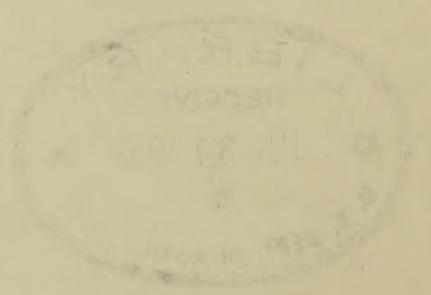
K. B. Crawford, Head
Power Management Section

Thomas B. Dunphy, Head
Power Procurement Section

Joseph Kaminski, Jr., Head
Power Transmission Section

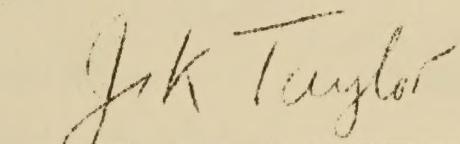
W. E. Rushlow, Head
Power Operations Section





SYSTEM POWER ANALYSISMISSOURI 59 COIE

On November 21, 1949, a loan in the amount of \$2,000,000 was approved for the Sho-Me Power Corporation which, together with previous loans, provided for the construction of a 69 kv transmission system which would be lease-operated by the Southwestern Power Administration. Now that bids have been received for sections of this system, it is apparent that the original loans will have to be supplemented if the construction as originally planned is to be completed. Additional funds in the amount of \$845,000 will be required. However, because of an increase in the load estimates and a decrease in the amount of facilities to be operated by Sho-Me, the average cost of power to serve the allocated load will be 0.635 cents as compared to 0.645 cents in the last study.



J. K. Taylor, Head
Power Planning Staff
Power Division

POWER COST STUDY

MISSOURI 59 COIE

INTRODUCTION

On November 21, 1949, a loan in the amount of \$2,000,000 was approved for the Sho-Me Power Corporation which, together with previous loans, provided for the construction of a 69 kv transmission system which would be lease-operated by SPA. Increasing costs, as evidenced from bids being received, make a supplementary loan necessary so that construction might be completed.

CONCLUSIONS

A loan of \$845,500 is required to cover the following:

| | |
|---------------------------------------|------------------|
| 340 miles, 69 kv transmission | \$2,668,000 |
| 53,750 kva of substation capacity | <u>2,142,000</u> |
| Total | \$4,810,000 |
| Previous loans for these facilities | <u>4,159,500</u> |
| Deficiency | \$650,500 |
| Rehabilitation of existing facilities | <u>195,000</u> |
| Loan Request | \$845,500 |

The estimated cost of power while serving the allocated load is 0.635 cents per kwh.

LOAD DATA

The allocated load used in the last study, dated October 13, 1949, was 47,300 kw and 194,788,000 kwh. Since that time, loans have been made to some of the distribution cooperatives and the allocated load now is 49,500 and 203,211,254 kwh. A breakdown by cooperative will be found in Appendix I.

PROPOSED CHANGES

The lines and substations as originally proposed for the 69 kv system can be found in Exhibits A and B of the October 13, 1949 study. The lines and substations now proposed are shown in Exhibit A and B of this study. These changes are in line with later surveys and board studies.

In the last study, it was assumed that 119 miles of line and 17,050 kva of substation capacity owned by member cooperatives would be transferred to Sho-Me. No agreement could be reached between the members and Sho-Me on these transfers, so these facilities are being omitted from this study. Agreement has been reached with one member cooperative, Missouri 49 Howell, which will transfer to Sho-Me 58 miles of line and 10,100 kva of substation capacity.

Also, \$244,625 held under stop-order but included in the last study for transmission system rehabilitation has had the stop-order lifted and the funds earmarked for distribution facilities. \$195,000 is therefore being requested for rehabilitation of the existing transmission system. Of this \$195,000, about \$16,000 is necessary to convert the existing 10,000 kva Maries substation for 69 kv. In the last study, funds were set up for a new 5,000 kva substation at Maries. Since a new one will not be built, agreement will have to be reached with SPA, if it takes over the existing substation, as to its value in dollars. For purposes of this study, no consideration was given to its being leased by SPA, but it was assumed that it would be operated by SPA; that is, its debt service was not assigned to SPA.

If this loan is approved, funds should be placed under stop-order until the contracts between Sho-Me and SPA are amended to take care of the planned changes and increased costs of the system.

COST OF POWER

The cost of power for the allocated load would average 0.635 cents per kwh. This compares with the 0.645 cents in the previous study. The lower cost is due to the fact that less money is being used for rehabilitation, fewer facilities are being transferred to Sho-Me, and the allocated load is higher. If SPA defaulted on its lease agreement and Sho-Me had to operate its entire 69 kv system, the cost of power for the allocated load would average 0.845 cents per kwh, the same as in the last study.

APPENDIX I

LOAD DATA

ALLOCATED KWH REQUIREMENTS

| | |
|---|-----------------|
| Missouri 18 Texas | 26,757,333 |
| 38 Reynolds | - |
| 43 Laclede | 31,365,433 |
| 45 Osage | 2,231,250 |
| 46 Taney | 3,363,750 |
| 49 Howell | 12,076,750 |
| 53 Polk | 2,000,000 |
| 54 Crawford | 17,191,465 |
| 66 Webster | 8,122,425 |
| 67 Wright | 5,510,625 |
| 68 Pulaski | 5,107,575 |
| Municipalities (Rollo, Cuba, Lebanon, Sullivan, Cabool, Richland) | 37,856,898 |
| Retail | 51,627,750 |
| | 203,211,254 kwh |

Allocated Demand - 49,500 kw

APPENDIX IIINVESTMENTSSummary

| | | |
|---------------------------------------|------------------|--|
| 1. Transmission Plant | | |
| 340 miles, 69 kv transmission | \$2,668,000 | |
| 53,750 kva of substation capacity | <u>2,142,000</u> | |
| Total | \$4,810,000 | |
| Previous Loan | <u>4,159,500</u> | |
| Deficiency | \$650,500 | |
| Rehabilitation of existing facilities | <u>195,000</u> | |
| Loan Request | \$845,500 | |

Transmission PlantLines

Willow Springs-Mansfield, Lebanon-Rolls, Willow Springs-Licking
(145.8)

| | |
|----------------------------------|--------------|
| Labor, Materials, & R/W Clearing | \$882,500 |
| Engineering | 44,250 |
| R/W Procurement & Legal | 59,000 |
| Contingency | 40,000 |
| Overhead | <u>4,250</u> |
| | \$1,030,000 |

Mansfield-Ava-Gainsville (45.2 miles)

| | |
|-------------------------|--------------|
| Labor and Material | \$224,235 |
| R/W Clearing | 54,360 |
| Engineering | 14,000 |
| R/W Procurement & Legal | 18,400 |
| Contingency | 27,000 |
| Overhead | <u>3,005</u> |
| | \$341,000 |

Cuba-Morrellton (29 miles)

| | |
|-------------------------|--------------|
| Labor and Material | \$145,000 |
| R/W Clearing | 34,800 |
| Engineering | 9,000 |
| R/W Procurement & Legal | 12,000 |
| Contingency | 18,000 |
| Overhead | <u>2,200</u> |
| | \$221,000 |

Lebanon-Camdenton (29 miles)

| | |
|---------------------------|--------------|
| Labor and Material | \$168,000 |
| R/W Clearing | 43,500 |
| Engineering | 10,600 |
| R/W Procurement and Legal | 12,000 |
| Contingency | 20,000 |
| Overhead | <u>3,900</u> |
| | \$258,000 |

APPENDIX II (Cont.)

| | |
|---|------------------|
| Rolla-Cuba, Lebanon-Marshfield, Marshfield-Mansfield (91 miles) | |
| Labor and Material | \$565,000 |
| R/W Clearing | 109,000 |
| Engineering | 33,700 |
| R/W Procurement & Legal | 37,000 |
| Contingency | 66,000 |
| Overhead | <u>7,300</u> |
| | <u>\$818,000</u> |
| | \$2,668,000 |

Substations (53,750 kva)

| | |
|--------------------|--------------------|
| Labor and Material | \$1,850,887 |
| Engineering | 92,543 |
| Land & Legal | 28,000 |
| Contingency | 152,000 |
| Overhead | <u>18,570</u> |
| | <u>\$2,142,000</u> |

Transfer, by debt assumption, of following facilities from Missouri 49 Howell

Line

18 miles, 69 kv, West Plains to Willow Springs)
40 miles, 34.5 kv, Willow Springs to Winona)

Substations \$ 615,633.48
7500 kva, 69/33/7.2-12.5, Willow Springs)
2000 kva, 69/33/7.2-12.5, West Plains)
600 kva, 34.5/7.2-12.5, Mountain View)

APPENDIX III

ANNUAL EXPENSE ALLOCATED LOAD

| | | |
|----|---|-------------|
| 1. | Energy at substations | 203,211,254 |
| 2. | Energy at sources (5% losses) | 214,000,000 |
| 3. | Energy generated at Niangua | 10,000,000 |
| 4. | Energy purchased | 204,000,000 |
| 5. | Peak KW required at substations - non-diversified | 49,500 |
| 6. | Peak KW required at sources - non-diversified | 52,000 |
| 7. | Peak KW required at sources - diversified | 49,600 |
| 8. | Dependable peaking - Niangua hydro | 600 |
| 9. | Peak purchased | 49,000 |

A. Annual expense if total requirements, except that generated at Niangua, are purchased from SPA, and Sho-Me operates its own 69 kv system.

Purchased Power

| | |
|----------------------------|----------------|
| 49,000 kwh @ \$6.60 per kw | \$324,000 |
| 204,000,000 kwh @ 0.4¢/kwh | <u>816,000</u> |
| | \$1,140,000 |

Generation (Niangua Hydro)

| | |
|---------------------|--------------|
| Operation | \$ 12,500 |
| Maintenance | 7,200 |
| Miscellaneous | 3,000 |
| Taxes and insurance | <u>9,000</u> |
| | 31,700 |

Transmission System

Operation, maintenance and replacement

Assumed lines and substations transferred to Sho-Me

| | |
|------------------------------|---------------|
| 40 miles of 34.5 kv line | \$ 3,840 |
| 18 miles of 69 kv line | 2,300 |
| 600 kva of 34.5 KV sub. cap. | 600 |
| 9500 kva of 69 kv sub. cap. | <u>11,100</u> |

| | |
|---|--------------|
| 340 miles of 69 kv line | \$17,840 |
| 61,750 kva of 69 kv sub. cap. | 43,500 |
| 2,000 kva of 34.5 kv sub. cap. | 72,300 |
| Breaker stations, switching, and relaying | <u>2,000</u> |

Taxes and insurance

Administrative and general

| |
|---------------|
| \$160,640 |
| 50,000 |
| <u>60,000</u> |
| \$270,640 |

Interest and Amortization

| | |
|------------------|---------------|
| \$729,986 @ 5.8% | \$ 42,300 |
| 2,159,000 @ 4.1% | 88,500 |
| 2,000,000 @ 4.1% | 82,000 |
| 615,633 @ 4.1% | 25,200 |
| 845,500 @ 4.1% | <u>34,700</u> |

| |
|-------------|
| \$272,700 |
| \$1,715,040 |
| 0.845 |

Grand Total
Cost per kwh at substations (cents)

- B. Annual expense if total requirements, excepting that generated at Niangua, are purchased from SPA, and SPA leases Sho-Me's 69 kv system.

| | |
|--|-------------|
| 1. Energy at substations | 203,211,254 |
| 2. Energy at sources (2% losses)* | 207,500,000 |
| 3. Energy generated at Niangua | 10,000,000 |
| 4. Energy purchased | 197,500,000 |
| 5. Peak KW required at sources - diversified | 48,600 |
| 6. Dependable peaking | 600 |
| 7. Peak purchased | 48,000 |

*SPA absorbs losses on 69 kv transmission system it leases

Purchased Power

| | |
|----------------------------|----------------|
| 48,000 KW @ \$6.60/kw | \$316,500 |
| 197,500,000 kwh @ 0.4¢/kwh | <u>790,000</u> |
| | \$1,106,500 |

Generation

(Same as Plan A, above)

Transmission System

| | |
|--|---------------|
| Assumed facilities (Same as Plan A, above) | \$17,840 |
| Taxes and insurance | 8,160 |
| Administrative and general | <u>50,000</u> |
| | \$76,000 |

Interest and Amortization

| | |
|------------------|--------------|
| \$729,986 @ 5.8% | \$42,300 |
| 615,633 @ 4.1% | 25,250 |
| 195,000 @ 4.1% | <u>8,000</u> |
| | \$75,500 |

| | |
|--------------------|-------------|
| Grand Total | \$1,289,750 |
| Cost/kwh delivered | 0.635¢ |

EXHIBIT A

69 KV LINES

| <u>Line Section</u> | <u>Miles - As Loaned</u> | <u>Miles - As Proposed</u> |
|--------------------------|--------------------------|----------------------------|
| Willow Springs-Mansfield | 47 | 45.4 |
| Lebanon-Rolla | 81 | 64 |
| Willow Springs-Licking | 51 | 36.4 |
| Mansfield-Gainesville | 44 | 45.2 |
| Marshfield-Camdenton | 69 | |
| Marshfield-Mansfield | 31 | |
| Rolla-Morrelton | 48 | |
| | <u>371</u> | <u>340</u> |

EXHIBIT B

69 KV SUBSTATIONS

| <u>Location</u> | As Loaned | | As Proposed | |
|-----------------|---------------------|------------|---|--------------------------|
| | <u>Voltage - KV</u> | <u>KVA</u> | <u>Voltage - KV</u> | <u>KVA</u> |
| Stanton | 69/* | 750 | 67/* | 1,500 |
| Sullivan | 69/*/2.3 | 1,750 | 67/* | 2,500 |
| Bourbon | 69/*/2.3 | 500 | - | - |
| Cuba | 69/34.5/*/ 2.3 | 3,500 | 67/* | 2,000 |
| St. James | 69/*/2.3 | 1,500 | - | - |
| Rolla | 69/34.5/*/ 2.3 | 9,000 | 67/34.4 34.4/* | 15,000 2,000 |
| Newburg | 69/*/2.3 | 1,000 | 67/* | 1,000 |
| Dixon | 69/*/2.3 | 1,000 | - | - |
| Crocker | 69/34.5/*/ 2.3 | 6,000 | 69/34.5 | 5,000 |
| Richland | 69/* | 750 | - | - |
| Stoutland | 69/*/2.3 | 750 | 67/* | 750 |
| Sleeper | 69/* | 3,000 | - | - |
| Lebanon | 69/*/2.3 | 2,000 | 67/* | 2,500 |
| Conway | 69/*/2.3 | 1,000 | 67/* | 1,000 |
| Marshfield | 69/*/2.3 | 4,000 | 67/* | 3,000 |
| Seymour | 69/*/2.3 | 1,500 | 67/* | 1,500 |
| Mansfield | 69/34.5/*/ 2.3 | 3,000 | 67/33.5 | 3,000 |
| Norwood | 69/*/2.3 | 750 | 67/* | 750 |
| Mt. Grove | 69/*/2.3 | 2,500 | 67/* | 2,500 |
| Cabool | 69/*/2.3 | 750 | 67/* | 750 |
| Houston | 69/*/2.3 | 3,000 | 67/* | 3,000 |
| Licking | 69/* | 1,000 | 67/* | 1,000 |
| Ava | 69/*/2.3 | 2,500 | 67/* | 2,500 |
| Gainesville | 69/* | 1,000 | 67/* | 1,000 |
| Niangua | 69/* | 2,500 | 67 | Switching structure only |
| Camdenton | 69/*/2.3 | 1,500 | 67/* | 1,500 |
| Maries | 69/34.5/* | 5,000 | Revisions only to present 10,000 kva substation | |

*Distribution Voltage